Burnett Mary region

Chapter 11

"The region contains a diversity of ecosystems including rainforest, eucalypt woodlands and forest as well as sandy heaths, coastal dune formations, mangroves and salt marsh."

Photo courtesy of Burnett Mary Regional Group

11.1 Profile

The Burnett Mary region, approximately 53,000 square kilometres, covers all lands drained by the Mary, Kolan, Burnett, Auburn, Boyne, Elliot, Gregory, Isis and Burrum Rivers and their tributaries. It encompasses the World Heritage-listed Great Sandy Straits, which includes Fraser Island, the largest sand island in the world. The southern tip of the Great Barrier Reef Marine Park is also included within the region's boundaries. The region contains a diversity of ecosystems including rainforest, eucalypt woodlands and forest as well as sandy heaths, coastal dune formations, mangroves and salt marsh. Regional industries include dairying, grazing, forestry, irrigated cropping, fisheries and tourism.

The region has a moderate, subtropical climate, with mean annual rainfall of about 1000 millimetres around the coastal regions. This region is judged to be high in recreation value due to the size of the population.

The Burnett Mary Regional Group is working with industry and land holders to improve land management practices for improved water quality outcomes. Land management practice improvement as a result of capacity building activities and incentives will reduce sediment, nutrients and pesticides entering waterways. This improved water quality will reduce the degrading impacts upon coastal habitats, including estuaries, seagrass and coral found in the Great Barrier Reef.

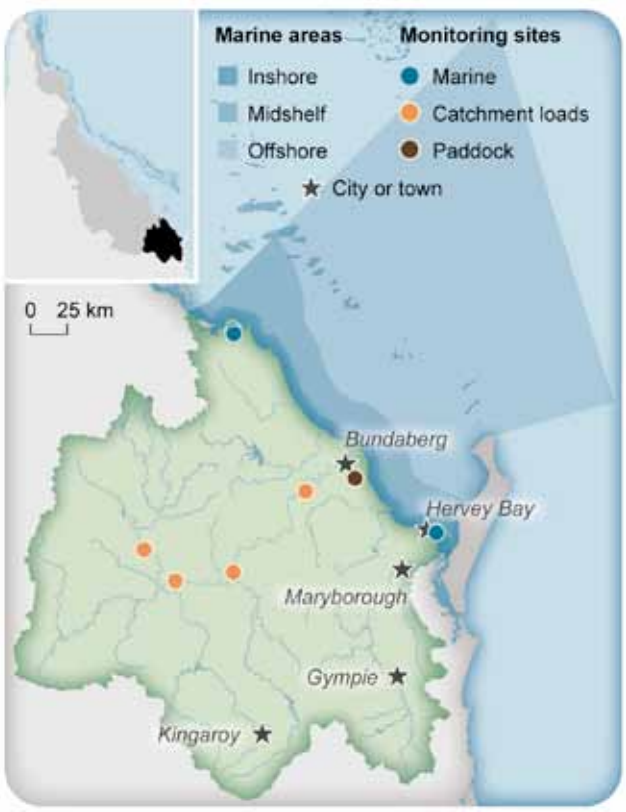

Figure 11.1 – Map of the Burnett Mary region and Great Barrier Reef Marine Park showing the paddock, catchment and marine monitoring sites.

The Burnett Mary region has a subtropical climate, with more rain in the summer and in the coastal areas that delivers sediments, nutrients and pesticides to the inshore and sometimes offshore portions of the reef in pulsed flows which can be affected by water reservoirs and dams. The landscape has mixed land use, including grazing, dairy, horticulture, sugarcane and other cropping. Surface and groundwater are important for irrigation. Urban centres such as Bundaberg, Hervey Bay and Maryborough are located on the coastal strip, with other towns such as Gympie and Kingaroy located inland. The region includes the Great Sandy Biosphere, and the Fraser Island World Heritage Area is located offshore. Habitats include offshore reefs, intertidal and deep-water seagrass and mangroves. Reef-based tourism, as well as commercial and recreational fisheries, is an important part of the regional economy.

Figure 11.2 – Conceptual model showing the key processes influencing water quality and reef ecosystem health in the Burnett Mary region.

11.2 Adoption of improved management practices

11.2.1 Results

- **In terms of nutrient management, cutting-edge (A) or best management (B) practices are used by 52 per cent of sugarcane growers, while 25 per cent of growers are using practices considered unacceptable by industry or community standards (D).**
- **In terms of herbicide management, the vast majority of sugarcane growers (89 per cent) are using common practice or equivalent to code of practice (C) management practices.**
- **Soil management practices considered unacceptable by industry and community standards (D) are used by 46 per cent of sugarcane growers.**
- **In terms of nutrient management, cutting-edge (A) or best management (B) practices are used by 42 per cent of horticulture producers.**
- **Cutting-edge (A) or best management (B) practices for soil management are used by 65 per cent of horticulture producers with 15 per cent using unacceptable (D) soil management practices.**
- **Management practice adoption data for the grazing and grain industries is not available at this time.**

The adoption of improved management practices for sugarcane and horticulture is presented using the ABCD management practice framework, a suite of management practices that are recommended to maintain and/or improve water quality:

A – Cutting-edge practice

B – Best practice

C – Common or code of practice

D – Practices considered unacceptable by industry or community standards.

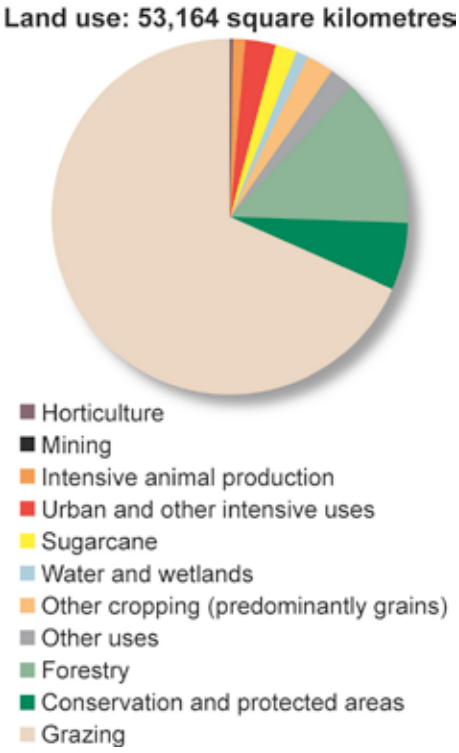

Figure 11.3 – Burnett Mary region land use.

11.2.2 Sugarcane

As at 2008–2009, there are 747 landholders growing sugarcane on 968 square kilometres of land within the Burnett Mary region. The overall management practices (including nutrient, herbicide and soil) are shown in Table 11.1. Adoption of specific nutrient, herbicide and soil management practices are also reported.

Cutting-edge (A) or best management (B) practices are used by 27 per cent of sugarcane growers. Common or code of practice (C) management is used by 48 per cent of sugarcane growers. Practices considered unacceptable by industry and community standards (D) are used by 25 per cent of growers.

Cutting-edge (A) or best management (B) practices for nutrient management are used by 52 per cent of sugarcane growers. Nutrient management practices considered unacceptable (D) are used by 25 per cent of growers.

Cutting-edge (A) or best management (B) practices for herbicides are used by only eight per cent of growers. The vast majority of growers (89 per cent) are using common or equivalent to code of practice (C) management practices. Only three per cent of growers are using herbicide management practices considered unacceptable (D).

Cutting-edge (A) or best management (B) practices for soil are used by 21 per cent of growers. Soil management practices considered unacceptable by industry and community standards (D) are used by 46 per cent of growers.

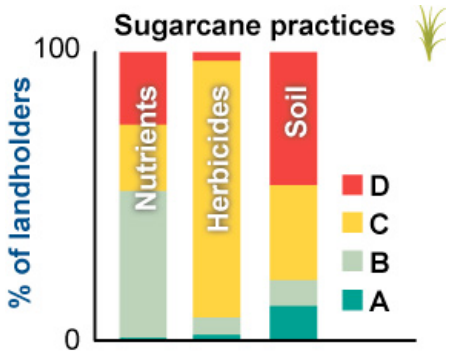

Figure 11.4 – Adoption of improved sugarcane management practices using the ABCD management framework for the Burnett Mary region.

Table 11.1 – ABCD sugarcane management practices for the Burnett Mary region (Source: modified from GHD, 2010e).

Combined management	A cutting-edge	B best practice	C code practice	D unacceptable practice
Number of canegrowers	37	164	362	184
% of canegrowers	5%	22%	48%	25%
Area (km²)	39	235	474	219
% of area	4%	24%	49%	23%
Nutrient management	**A cutting-edge**	**B best practice**	**C code practice**	**D unacceptable practice**
Number of canegrowers	7	381	172	187
% of canegrowers	1%	51%	23%	25%
Area (km²)	10	494	222	241
% of area	1%	51%	23%	25%
Herbicide management	**A cutting-edge**	**B best practice**	**C code practice**	**D unacceptable practice**
Number of canegrowers	15	45	665	22
% of canegrowers	2%	6%	89%	3%
Area (km²)	29	58	861	19
% of area	3%	6%	89%	2%
Soil management	**A cutting-edge**	**B best practice**	**C code practice**	**D unacceptable practice**
Number of canegrowers	90	67	247	343
% of canegrowers	12%	9%	33%	46%
Area (km²)	77	155	339	396
% of area	8%	16%	35%	41%

11.2.3 Horticulture

As at 2008–2009, there are 280 landholders growing horticultural crops on 191 square kilometres of land within the Burnett Mary region. The main horticultural crops include macadamias, citrus and vegetables.

The overall management practices (including nutrient, herbicide and soil) are shown in Table 11.2. Adoption of specific nutrient, herbicide and soil management practices are also reported.

Cutting-edge (A) or best management (B) practices are used by 59 per cent of producers. Code of practice or common practices (C) are used by 27 per cent of producers. Practices considered unacceptable by industry and community standards (D) are used by 14 per cent of producers.

Cutting-edge (A) or best management (B) practices for nutrients are used by 42 per cent of producers. Code of practice or common nutrient management practices (C) are used by 36 per cent of producers. Nutrient management practices considered unacceptable (D) are used by 22 per cent of producers.

Cutting-edge (A) or best management (B) practices for herbicides are used by 70 per cent of producers, while 5 per cent of producers are using unacceptable (D) nutrient management practices.

Cutting-edge (A) or best management (B) practices for soil are used by 65 per cent of producers, with 20 per cent using code of practice or common practices (C). Soil management practices considered unacceptable (D) are used by 15 per cent of producers.

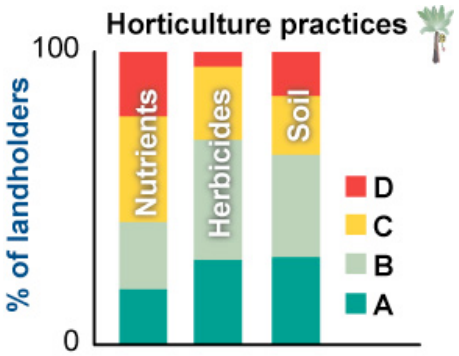

Figure 11.5 – Adoption of improved management practices for horticulture using the ABCD management framework for the Burnett Mary region.

Table 11.2 – ABCD horticulture management practices for the Burnett Mary region (Source: modified from Wallace S, 2010).

Combined management	A cutting-edge	B best practice	C code practice	D unacceptable practice
Number of horticulture producers	72	93	75	40
% of horticulture producers	26%	33%	27%	14%
Area (km²)	60	64	42	25
% of area	32%	34%	22%	12%
Nutrient management	**A cutting-edge**	**B best practice**	**C code practice**	**D unacceptable practice**
Number of horticulture producers	53	66	100	61
% of horticulture producers	19%	23%	36%	22%
Area (km²)	57	40	55	39
% of area	30%	21%	29%	20%
Herbicide management	**A cutting-edge**	**B best practice**	**C code practice**	**D unacceptable practice**
Number of horticulture producers	81	115	71	13
% of horticulture producers	29%	41%	25%	5%
Area (km²)	66	78	39	8
% of area	34%	41%	20%	5%
Soil management	**A cutting-edge**	**B best practice**	**C code practice**	**D unacceptable practice**
Number of horticulture producers	83	96	55	46
% of horticulture producers	30%	35%	20%	15%
Area (km²)	58	75	31	27
% of area	30%	39%	16%	14%

11.3 Catchment indicators

11.3.1 Results

- **The total riparian area in the Burnett Mary region is 880,000 hectares, of which an estimated 3800 hectares are likely to be susceptible to erosion (non-forested and low groundcover).**
- **The loss of riparian vegetation between 2004 and 2008 was 9185 hectares (1.04 per cent), the highest proportion among the Great Barrier Reef regions.**
- **The Burrum catchment had the highest proportion of riparian clearing between 2004 and 2008, with 791 hectares (1.84 per cent).**
- **The extent of wetlands (including vegetated freshwater swamps, lakes and mangroves/salt flats) across the Burnett Mary region as at 2005 is 50,000 hectares. This represents 70 per cent of wetlands remaining from pre-European times.**
- **The loss of vegetated freshwater swamps since pre-European times is 42 per cent.**
- **The Kolan, Burnett and Mary catchments have had significant loss of wetlands, with between 62 and 86 per cent of vegetated freshwater swamps lost since pre-European times.**
- **The 2009 mean dry season groundcover for the grazing lands of the Burnett Mary region was 92 per cent, which is above the Reef Plan target of 50 per cent. The Burrum catchment had the highest proportion of area below 50 per cent (4.9 per cent) and 3.5 per cent of the area below 30 per cent groundcover.**

11.3.2 Riparian areas

The Burnett Mary region has a total of 650,000 hectares (74 per cent) of riparian areas forested, and 210,000 hectares (24 per cent) non-forested with high groundcover. Only 3800 hectares (0.43 per cent) of riparian areas are non-forested with low groundcover making these areas likely to be susceptible to erosion and, therefore, sediment loss to streams.

The loss of riparian vegetation between 2004 and 2008 was 9185 hectares (1.04 per cent). This was the highest proportion of all the Great Barrier Reef regions. The Burrum catchment had the highest proportion of clearing between 2004 and 2008, with 791 hectares (1.84 per cent).

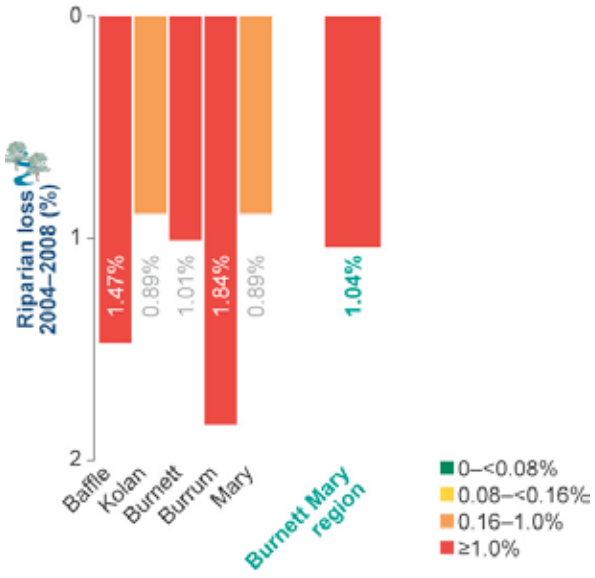

Figure 11.6 – Loss of riparian vegetation between 2004 and 2008 in the Burnett Mary region.

11.3.3 Wetlands

As at 2005 there are approximately 50,000 hectares of wetlands in the Burnett Mary region. Of these wetland areas, there are:

- 26,000 hectares of vegetated freshwater swamps (palustrine wetlands). The greatest area of vegetated freshwater swamps is in the Baffle, Burrum and Mary catchments.
- 360 hectares of lakes (lacustrine wetlands).
- 23,000 hectares of mangroves/salt flats (estuarine wetlands). These wetlands occur in the greatest extent in the Baffle catchment.

In total, 70 per cent of the total wetlands remain since pre-European settlement, with only 58 per cent of freshwater swamps remaining. The Kolan, Burnett and Mary catchments have had significant wetlands loss, with between 62 per cent and 86 per cent of vegetated freshwater swamps lost. This loss is particularly prevalent in the lowlands of these catchments. Overall 95 per cent of mangroves and salt flats remain for the region.

The overall loss of the Burnett Mary region's wetlands between 2001 and 2005 was 180 hectares (0.36 per cent). The loss of vegetated freshwater swamps over the 2001–2005 period was 181 hectares (0.69 per cent), with the greatest loss in the Kolan (2.53 per cent) and Mary (1.21 per cent) catchments. There was a moderate reduction in the extent of mangroves/salt flats over the 2001–2005 period, ranging from nil to 0.28 per cent.

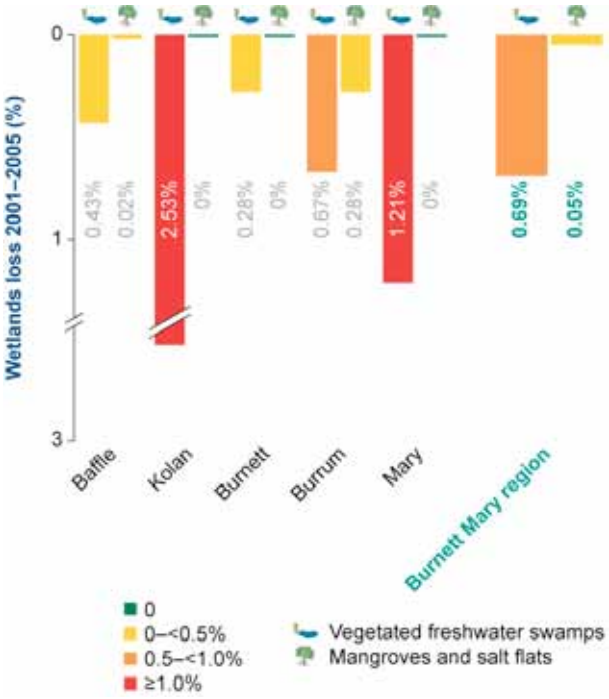

Figure 11.7 – Loss of vegetated freshwater swamps and mangroves/salt flats (between 2001 and 2005) for the Burnett Mary region.

Table 11.3 – Areas forested within the riparian buffer, non-forested with high groundcover (above or equal to 50 per cent), non-forested with low groundcover (less than 50 per cent) for 2008 and the area cleared from 2004 to 2008.

Catchment	Total riparian buffer area	Forested		Non-forested high groundcover		Non-forested low groundcover		Missing data*	2004–2008 riparian clearing	
	(ha)	Area (ha)	%	Area (ha)	%	Area (ha)	%	%	Area (ha)	%
Baffle	55,305	48,018	86.82	6623	11.98	111	0.20	1.00	813	1.47
Burnett	503,891	347,557	68.97	147,785	29.33	2846	0.56	1.13	5114	1.01
Kolan	46,340	37,804	81.58	7624	16.45	88	0.19	1.78	414	0.89
Burrum	42,892	39,018	90.97	2940	6.85	189	0.44	1.74	791	1.84
Mary	230,974	179,012	77.50	45,870	19.86	565	0.24	2.39	2053	0.89
Burnett Mary region	**879,402**	**651,409**	**74.07**	**210,842**	**23.98**	**3799**	**0.43**	**1.52**	**9185**	**1.04**

*Missing data refers to areas affected by cloud, cloud shadow, topographic shadow or areas of water within the riparian buffer.

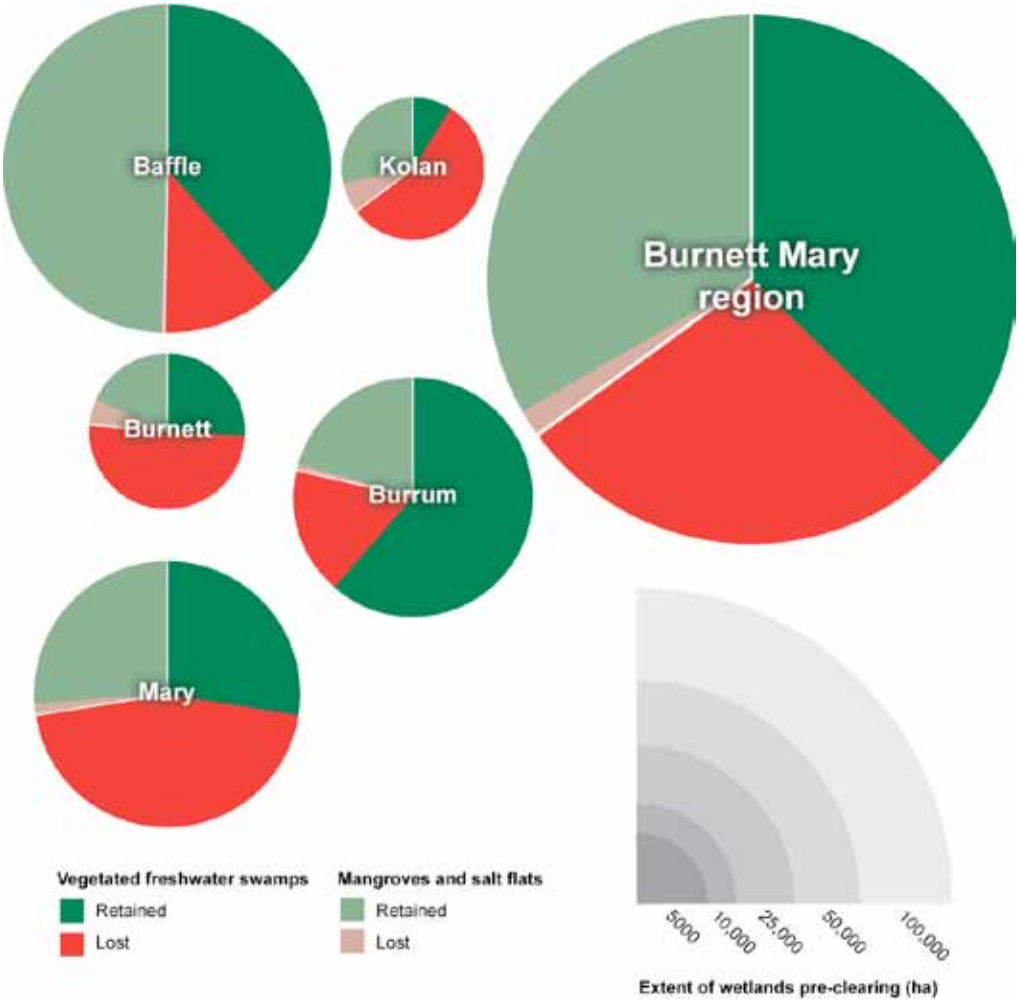

Figure 11.8 – Extent (hectares) and proportion of vegetated freshwater swamps and mangroves/salt flats remaining from pre-European extent in the Burnett Mary region.

Table 11.4 – The extent of wetlands in 2005 and change between 2001 and 2005 across the Burnett Mary region for vegetated freshwater swamps, lakes and mangrove/salt flat wetlands.

	Vegetated freshwater swamps			Lakes			Mangroves and salt flats			All wetlands		
Catchment	Extent 2005 (ha)	Extent (% pre-European)	Loss 2001–2005 (% of 2001)	Extent 2005 (ha)	Extent (% pre-European)	Loss 2001–2005 (% of 2001)	Extent 2005 (ha)	Extent (% pre-European)	Loss 2001–2005 (% of 2001)	Extent 2005 (ha)	Extent (% pre-European)	Loss 2001–2005 (% of 2001)
Baffle Creek	10,430	77	0.43	180	100	-7.04	13,275	99	0.02	23,885	87	0.15
Burnett	1580	34	0.28	15	100	0	1115	78	0	2710	48	0.17
Burrum	8840	78	0.67	160	100	0	2935	96	0.28	11,935	82	0.57
Kolan	460	14	2.53	NP	NP	NP	1425	80	0	1885	38	0.63
Mary	4900	38	1.21	5	100	0	4635	95	0	9540	51	0.63
Burnett Mary region	**26,210**	**58**	**0.69**	**360**	**73**	**-7.04**	**23,385**	**95**	**0.05**	**49,955**	**70**	**0.36**

NP – wetland type was not present.

11.3.4 Groundcover in grazing lands

Groundcover is influenced by a combination of factors, including the land type, climate and management practices. The majority of the region's grazing lands are in the Burnett catchment. The long term mean dry season groundcover for the grazing lands of the Burnett Mary region over the 1986 to 2009 period is 88 per cent (Table 5.6), which is above the Reef Plan target of 50 per cent. Similar to other regions, the average groundcover in 2009 is higher than the historical average, increasing to 92 per cent. The proportion of the grazing area with groundcover of 50 per cent or greater in 2009 is high (99 per cent). Only 1.1 per cent of the area was below the 50 per cent groundcover target, with 0.4 per cent of the area below 30 per cent. The Burrum catchment had the highest proportion of area below 50 per cent (4.9 per cent), with 3.5 per cent of the area below 30 per cent groundcover.

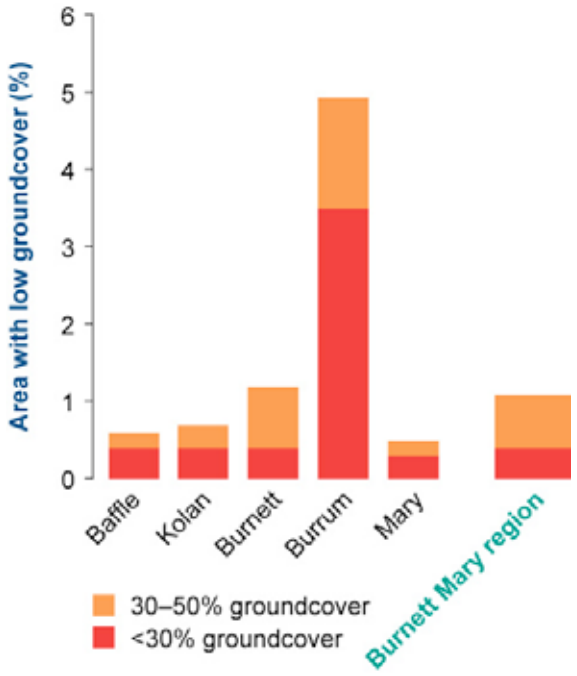

Figure 11.9 – Area with low groundcover (under 30 per cent and between 30 per cent and 50 per cent) as at 2009 for the Burnett Mary region.

11.4 Catchment loads

The total suspended solids load leaving the catchments of the Burnett Mary region is an estimated 3.1 million tonnes per year, of which 2.8 million tonnes are from human activity. Most of this sediment originates from the extensive grazing lands within the region.

The estimated total nitrogen load leaving the catchments of the Burnett Mary region is 13,000 tonnes per year, of which 12,000 tonnes are from human activity. A large proportion of this total load is in particulate nitrogen (10,000 tonnes per year).

The total phosphorus load leaving the catchment of the Burnett Mary region is 3100 tonnes per year, of which 2900 tonnes are from human activity. Similar to total nitrogen, a large proportion of the total phosphorus load is in particulate form (2700 tonnes per year).

The dissolved nitrogen load is 2800 tonnes per year, of which 1400 tonnes are from human activity. The dissolved phosphorus load is 350 tonnes per year, of which 258 tonnes are from human activity.

The total photosystem inhibiting (PSII) pesticide load leaving the catchments of the Burnett Mary region is an estimated 990 kilograms per year.

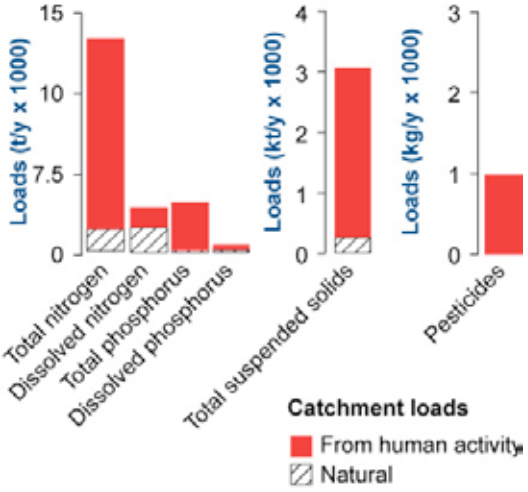

Figure 11.10 – Total and anthropogenic (caused by human activity) pollutant load estimates for total suspended solids, total nitrogen, total phosphorus, dissolved nitrogen, dissolved phosphorus and pesticides.

11.5 Great Barrier Reef water quality and ecosystem health

11.5.1 Results

- **Inshore waters within the Great Barrier Reef Marine Park portion of the Burnett Mary region are in very good condition.**
- **Seagrass meadows in the region, although in good condition overall, are in decline or have failed to recover from the effects of flooding in 2006. The presence of many reproductive structures suggests recovery may be possible.**

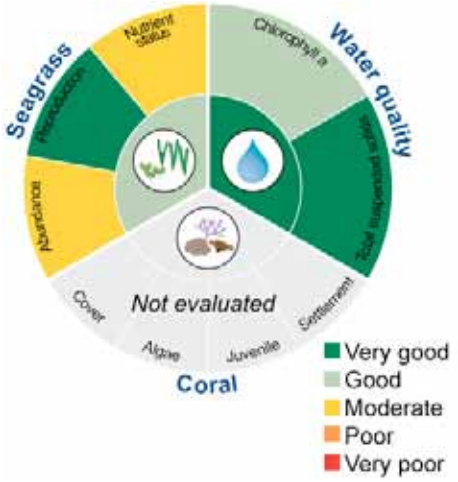

Figure 11.11 – Great Barrier Reef water quality and ecosystem health of the Burnett Mary region showing the status of water quality and seagrass (grey = no coral data).

11.5.2 Water quality

Freshwater discharge from regional rivers was well below the long term annual median flow for the region during 2008–2009. Great Barrier Reef Marine Park Water Quality Guideline exceedances for chlorophyll *a* and suspended solids concentrations were calculated for the May 2008 to April 2009 period from satellite imagery (Table 11.5). Chlorophyll *a* and suspended solids concentrations for the Great Barrier Reef Marine Park portion of the Burnett Mary region were generally better than other regions. It should be noted that the water quality data presented here has been validated only for the area of the Great Barrier Reef Marine Park that falls within the Burnett Mary region and this summary is not necessarily representative of the full region's marine waters.

Table 11.5 – Summary of the exceedance of mean annual chlorophyll *a* and non-algal particulate matter (as a measure of suspended solids) for the Burnett Mary region (1 May 2008–30 April 2009).

Chlorophyll *a*: Relative area (%) of the waterbody where the annual mean value exceeds the water quality guideline value			**Suspended solids:** Relative area (%) of the waterbody where annual mean value exceeds the water quality guideline value		
Inshore	Midshelf	Offshore	Inshore	Midshelf	Offshore
27	2	0	13	2	3

11.5.3 Seagrass status

Seagrasses are monitored at two estuarine locations in the north and south of the Burnett Mary region respectively. These meadows are in decline or have failed to recover from the effects of flooding in 2006 (Figure 11.12). Meadows in Rodds Bay are in good reproductive condition; however, meadows in Hervey Bay are in poor reproductive condition, raising concerns about the ability of seagrass meadows in Hervey Bay to recover from significant disturbance events such as cyclones and floods. The region's seagrasses have nutrient rich tissues, and those at Urangan are subject to low light regimes.

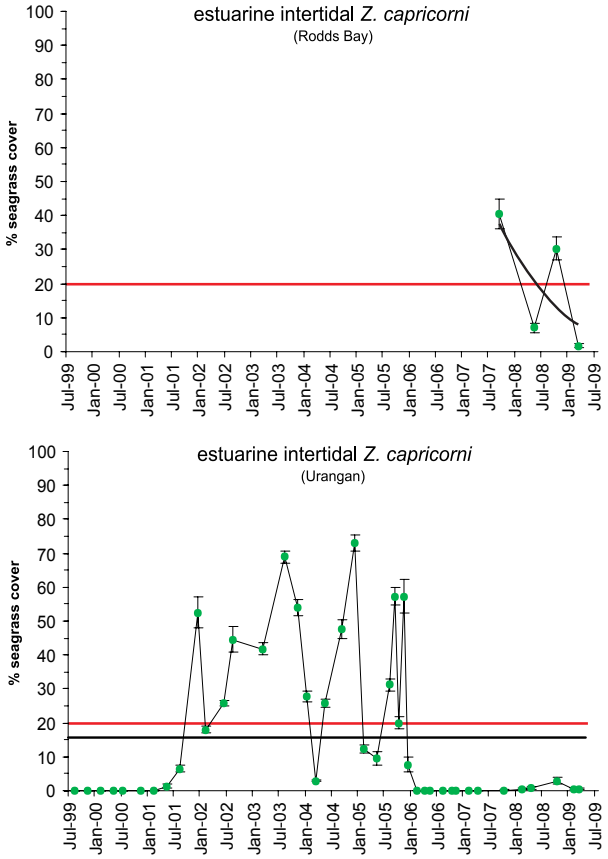

Figure 11.12 – Long term seagrass cover, Urangan (estuarine) and Rodd's Harbour (estuarine), Burnett Mary region, compared with long term Great Barrier Reef average (red line) (Source: DEEDI).