

Keating's Lagoon 2010 Post Fencing Wetland Condition Assessment



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A wetland condition assessment was conducted at Keating's Lagoon on the 11th November 2010 in order to assess the health of the wetland since the construction of a feral pig and cattle exclusion fence around the wetland. Results from this survey will be compared with surveys conducted prior to construction of the fence. The survey was conducted in accordance with the Cape York Freshwater Wetland Assessment Methods (Howley and Stephan 2009).

On the 28/8/07, prior to construction of the fence, a survey of Keating's Lagoon was carried out following the Keith Bolton (2001) North Coast Wetland Assessment for Paperbark Wetlands. The CYMAG methods have been adapted from Bolton (2001) methods, therefore much of the information gathered from the two surveys can be directly compared. The results from vegetation and bank condition (feral impact) transects established and monitored by SCYC in September 2007 will also be compared against the results of the current survey. Any differences in the survey methods or data scoring methods will be noted in this report.

Keating's Lagoon Survey Results 28/08/2007 and 11/11/2010

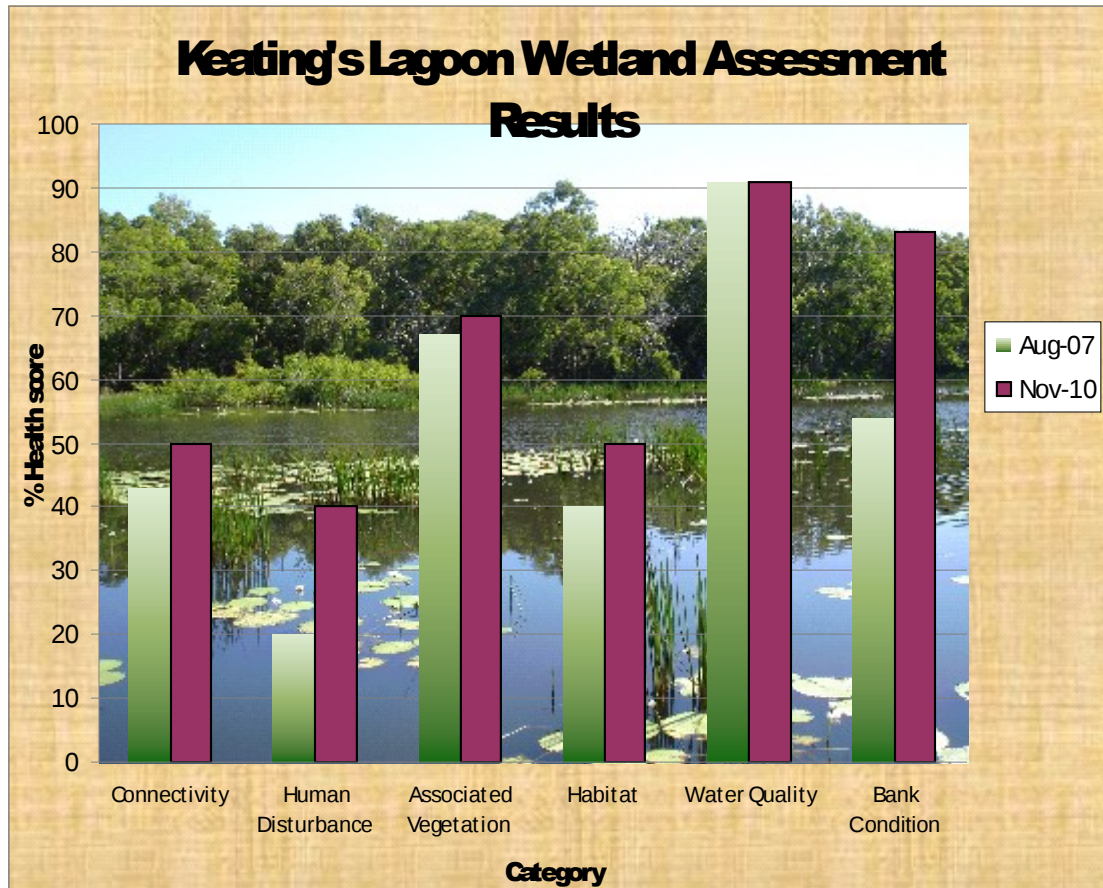
	8/28/2007	11/11/2010
Category:	Score:	Score
Connectivity*	43	50
Human Disturbance	20	40
Associated Vegetation	67	70
Aquatic Vegetation	NA	59
Habitat	40	50
Water Quality	91	91
Bank Condition**	54	83
Acid Sulphate Soils	40	NA
Average Score and Rating	50.7 (Poor to Average)	63.3 (Medium)

* Variations in scoring methods have resulted in different Connectivity scores

**2010 Score derived from survey data inside the Pig Exclusion Fence only

Wetland Health Rating Table (Bolton 2001)

Health rating	Score
Excellent	>85%
Very good	>75% - 85%
Good	>65% - 75%
Medium	>55% - 65%
Poor to average	>45% - 55%
Poor	35% - 45%
Very poor	<35%



Discussion:

The **Human Disturbance** index measures how much human impact there has been on the Lagoon. Factors include grazing, fire, weeds, rubbish, clearing, drains, domestic and feral animals, plant and bank removal. Prior to fencing, Keating's scored an index rating of "Very Poor" (20 out of 100%) due primarily to the high level of feral animals, weeds and a causeway impacting drainage from the wetland. In the current study, the level of human impact has been improved to "Poor to Average" (40%) due to the exclusion of pigs and cattle from the lagoon. The altered drainage, weeds and other adjacent landuse continue to impact on the wetland health.

The **Associated Vegetation** (Bolton 2001) or **Fringing Vegetation** (Howley and Stephan 2009) index measures how healthy the vegetation associated with the paperbark wetland is. Indicators used to quantify the health of the Vegetation include riparian vegetation diversity, the number and amount of infiltration of weeds and the extent of the riparian zone. Keating's Lagoon achieved a "Good" rating for Associated or Fringing Vegetation, with a high diversity of plants recorded. The pre-fencing score and post-fence score remained much the same. A number of weeds were recorded during both surveys; however the majority of weed species were limited to the outer edges of the wetland. During the 2010 survey weeds such as Hyptis, Lantana and Sensitive weed were common around and outside the fenceline but were rare within the

Paperbark forest. The declared weed *Hymenachne* was the only weed that had infiltrated the wetland area.

Weeds Identified at Keatings Lagoon

Weed Species	Common Name	Level of Infiltration	Comments
<i>Panicum maximum</i>	Guinea Grass	Low	
<i>Lantana camara</i>		Low	
<i>Passiflora foetida</i>		Low	
<i>Mimosa pudica</i>	Sensitive weed	Low	
<i>Chromolaena odorata</i>	Siam weed	Low	Sample collected- not confirmed
<i>Hyptis suaveolans</i>		Low	
<i>Lucerne</i>		Low	
	Gooseberry	Low	
<i>Hymenachne amplexicaulis</i>		Low	Sprayed by SCYC

The **Aquatic Vegetation Index** received a score of 59% (“Medium”). Six species of aquatic plant were identified. These included 2 species of *Nymphaea* (Water Lily), *Nymphoides indica* (Water Snowflake), *Eleocharis* sp., *Nardoo* sp., and *Myriophyllum*. The Water Lily was the dominant plant, and aquatic plant cover at the Lagoon was approximately 80%. The aquatic weed *Hymenachne* was present at a low level of infiltration, due to on-going spraying by SCYC and CYWAFAP and QPW.

The **Habitat** index determines how effective this wetland is at providing habitat for native animals. The provision of habitat is a very important ecological role of paperbark wetlands, which can be great buffers and maintainers of biodiversity (Keith Bolton 2001). The index records fauna species and indicators such as fallen branches, leaf litter and holes in trees. In 2007, Keating’s Lagoon achieved a “Poor” (40%) rating which may have been a function of the brief nature of the survey, the time of year and the level of human disturbance. In 2010, the Habitat Score had improved to 50% (“Poor to Average”). A thick layer of leaf litter and animal burrows, as well as increased numbers of frogs identified during fauna surveys at the wetland since construction of the fence (Lyons, 2010) contributed to the improvement in habitat value.

Bank Condition was assessed during the 2010 and 2007 assessments, including the amount of feral pig or cattle impacts around the edge of the wetland, ground cover and signs of erosion. Prior to the exclusion of pigs and cattle (19/9/07), between 83% of *eleocharis* meadows were dug up by pigs, and an average of 3.3% of ground cover was dug up underneath the paperbarks. During the 2010 survey, no pig diggings or cattle hooves were observed inside the fence (in paperbark areas), while on average there were 3.7 cattle hooves per 0.5m² quadrat and 86% of the wetland edge was dug up by pigs in paperbark and *eleocharis* meadows outside of the fence. The Bank Condition index for the fenced off wetland area received a score of 83% (“Very Good”). Pre-fencing surveys did not score bank condition by the same methods, but an approximate calculation of the bank condition score using 2007 transect data is 54%, “Poor to Average”.

**Cattle & Feral Pig Impact :
2010 Inside and Outside of Fence Survey Results and 2007 Pre-Fence Survey**

	Inside Exclusion Fence - 2010	Outside Exclusion Fence - 2010	Keatings Lagoon before Exclusion Fence - 2007
Average Number of Cattle Hooves per 0.5m ²	0	3.7	Not analysed
Average Percent of Ground Dug up by Pigs	0%	86%	46%
Bank Condition Score	83% (Good)	46% “Poor to Average”	54% “Poor to Average”

Water Quality:

Potential acid sulphate soils were identified at Keating’s Lagoon using hydrogen peroxide soil tests in 2007. Acid sulphate soils may be disturbed by feral pig diggings, releasing acids into adjacent waters. Ponded water in pig diggings at Keating’s have been recorded with a pH as low as 4.21. With feral pigs and cattle excluded from the majority of the Lagoon, it is possible that pH would increase and water turbidity, nutrient and bacteria levels would decrease.

Water Quality indicators including pH, turbidity, temperature, and salinity have been monitored at sites both inside (Site 6 – Walkway Bridge) and outside of the fence (Site 7 – Near Causeway) on a number of occasions before and after the fence construction. Total and dissolved nutrients and bacteria (faecal coliform) samples from 3 sites were also analysed in September 2007 and November 2010.

Water quality at Keating’s has varied greatly during each visit, making pre- and post fence comparisons difficult to quantify. The pH at Site 6 ranged from 5.99 to 6.27 prior to fencing, and from 6.10 to 6.29 after the fence was constructed. Pre-fence turbidity ranged from 7 NTU in the wet season to 1000 NTU (December 2008), while turbidity has been measured at between 20 NTU to 280 NTU after the Lagoon was fenced. During the recent (November 2010) survey, water turbidity was recorded at 49 NTU. A large number of magpie geese were at the lagoon and are believed to have stirred up the water.

Nutrient Levels both inside the fence (KL-2 and KL-3) and outside the fence (KL-1) were higher in November 2010 than in September 2007. This may be due to the warmer water and higher turbidity recorded at the lagoon during the 2010 monitoring event. 2010 Nutrient levels were correlated to the level of turbidity, with slightly higher levels of nutrients recorded at the Bird Hide, which also had the highest turbidity (See Table Below). Ammonia levels exceeded the Water Quality Guidelines for the Protection of Aquatic Ecosystems.

2007 and 2010 Nutrient Levels

Sample Location	Date	Total Phosphorus	Dissolved Phosphorus	Ammonia Nitrogen	Nitrogen Oxides	Total Nitrogen	Turbidity
		mg/L	mg/L	mg/L	mg/L	mg/L	NTU
PRE-FENCE							
KL-1 (Keating's Lagoon)	05/09/07	0.028	< 0.002	0.004	< 0.002	0.56	5
KL-2 (Bird Hide)	05/09/07	0.010	< 0.002	0.005	< 0.002	0.39	5
KL-3 (Walkway bridge)	05/09/07	0.017	< 0.002	0.005	0.002	0.47	7
POST-FENCE							
KL-1 (Keating's Lagoon- outside fence)	11/11/10	0.0325	0.0028	0.016	0.0028	0.7387	5.9
KL-2 (Bird Hide)	11/11/10	0.0668	0.0059	0.0231	0.0059	1.0465	75
KL-3 (Walkway bridge)	11/11/10	0.0336	0.0039	0.0202	0.0039	0.6955	49
Wetland Water Quality Guidelines*		0.01 – 0.05	0.005 – 0.025	0.01	0.01	0.35 – 1.2	

*Qld EPA (2010) and ANZECC 2000 Guidelines for the Protection of Aquatic Ecosystems, 95 % Level of Protection, Freshwater Wetlands & Estuary

Faecal coliform levels at the site were extremely high both before the site was fenced and after. The high levels detected in November 2010 may be attributed to the large number of magpie geese observed at the sample site for several weeks prior to sample collection.

Keatings Lagoon Bacteria Concentrations

Site	Date Time	Faecal coliform CFU/100mL
Walkway Bridge	10/29/2007 14:00	> 8000
Walkway Bridge	11/19/2007 16:00	1800
Walkway Bridge-1	14/11/2010 11:00	60000
Walkway Bridge-2	14/11/2010 11:05	49000

References:

Bolton, K.G.E. (2001) **North Coast Wetland Assessment Guide Manual. Paperbark Wetlands.** Department of Land and Water Conservation and Southern Cross University. ISBN 0 7347 5232 6

Howley, C. and Stephan, K. (2009) Cape York Freshwater Wetland Assessment Field Data Sheets. CYMAG Environmental, Cooktown, Qld. (www.cymag.com.au/publications)

Lyons, Barry (?) Keatings Lagoon Fauna Survey.