

CHOWILLA FLOODPLAIN ICON SITE – LIGNUM CONDITION MONITORING Data Analysis 2016

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Analysis of lignum condition monitoring data collected during surveys undertaken in autumn 2016 on the Chowilla Floodplain. Analysis produced by Dr Stuart Brown, Wetlands and Floodplains Team, Department of Environment, Water and Natural Resources (DEWNR).

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1 CHOWILLA FLOODPLAIN LIGNUM CONDITION MONITORING 2016

The following report presents analysis of the lignum Condition Monitoring data collected during surveys undertaken in autumn 2016 on the Chowilla Floodplain by staff from Department of Environment, Water and Natural Resources (DEWNR). The analysis incorporates previous annual condition monitoring data as reported in the 2013-14 synthesis report (reference). A data QA/QC review process undertaken in 2016 has resulted in some minor differences in the LCI scores presented in the preceding report (2013-14 synthesis report *reference*) and those presented here. The differences are not substantive. However, the preceding report should be regarded as having been superseded.

The Lignum Condition Monitoring is a component of the Chowilla Floodplain Icon Site Condition Monitoring program funded through The Living Murray initiative of the Murray-Darling Basin Authority.

1.1 Ecological Objectives and Targets

The Ecological Objective and Ecological Target for lignum (tangled lignum, *Duma florulenta*) is presented in Table 1.

Table 1: Ecological Objective and Ecological Target for lignum condition at Chowilla Floodplain.

Type	Ecological Objective	Ecological Target
Lignum (<i>Duma florulenta</i>)	Maintain viable lignum populations in 40% of existing areas	In standardised transects that span the floodplain elevation gradient and existing spatial distribution, ≥70% of lignum plants will have a Lignum Condition Score (LCI) ≥6 by 2020

1.2 Lignum condition - assessment method

The Lignum Condition Index (LCI) is determined using the method outlined in the Condition Monitoring Plan (Wallace, 2010). Briefly, LCI scores are calculated by summing the scores assigned for viability and colour (see Table 2). The condition of all lignum plants that intersect or lie within 2.5m from either side of a 100m transect are assessed. It is important to note that (1) the actual number of sites assessed in any year may vary pending access issues, and (2) the actual number of plants assessed in any year fluctuates corresponding with the intersection of plants with the alignment of the transect. Surveys conducted prior to 2009 utilised the Southgate Greenness Index, and as such, results from those years are not presented as it is unclear if the two methods are directly comparable.

1.2.1 Interpretation of Lignum Condition Index Scores

The Ecological Target of an LCI score of 6 or above represents a plant in "good" condition. This score can be achieved either by a low percent crown score (i.e. 1-5%) and a moderate-high colour score (i.e. ≥5), or a high percent crown score (i.e. ≥76-95% and a low colour score (i.e. 1) (see Table 2 for details). An LCI score of ≤4 represents a plant in stressed condition. This incorporates either a low percent crown score (i.e. 1-5%) and a low to moderate colour score (i.e. ≤3), or a low to moderate percent crown score (i.e. 1-50%) and a low colour score (i.e. 1). An LCI score of 2 represents a plant in very poor condition with a low percent crown score (i.e. 1-5%) and a low colour score (i.e. 1). At this condition, rootstock is presumed to be viable; plant will recover to moderate scores if watered. However, response may be from new growth rather than improvement in condition of above ground biomass. Hence habitat value is compromised. If not watered, likelihood of recovery decreases. The threshold for management action specified in the Operations Plan for Chowilla Creek Regulator and ancillary structures (Wallace and Whittle, 2014) is "Within the area that can be influenced by management action(s), more than 10% of established viable plants receive LCI scores ≤2".

Table 2: Categorical score method used to assess lignum plant condition (from Scholz *et al.*, 2007)

Viability		Colour	
Score	Percent of viable crown	Score	Colour of viable crown
6	>95%	6	All green
5	76 – 95%	5	Mainly green
4	51 – 75%	4	Predominantly green
3	26 – 50%	3	Half green, half yellow brown
2	6 – 25%	2	Mainly yellow brown
1	1 – 5%	1	All yellow brown
0	0%	0	No viable stems

1.2.2 Distribution of monitoring effort

Lignum surveys were conducted at six locations using the standard LCI method described above. At each of these locations, three 5x100m transects were assessed. At another two locations (Monomon Depression and Twin Creeks Depression) the condition of individual plants was assessed ($n = 20$ plants per location). Details of distribution of sampling effort are provided in Table 3 and in Figure 1.

Table 3: Distribution of monitoring effort for lignum condition at the Chowilla Icon Site. No lignum monitoring was conducted in 2015. The introduction of three new transect sites was planned for 2015 but will occur in 2017.

Site	Transects	Habitat	2009	2010	2011	2012	2013	2014	2015	2016
Coppermine complex north	1-3	Floodplain	✓	✓	✓	✓	✓	✓		✓
Coppermine complex west	4-6	Floodplain	✓	✓	✓	✓	✓	✓		✓
Coppermine complex south	7-9	Floodplain	✓		✓	✓	✓	✓		✓
Gum Flat	1-3	Floodplain	✓	✓	✓		✓			✓
Monomon Creek Depression	1-3	Floodplain	✓	✓	✓	✓	✓			✓
Lake Littra	1-3	Wetland						✓		✓
Brandy Bottle	1-3	Wetland	✓					✓		✓
Werta Wert	1-3	Wetland						✓		✓
Lake Limbra	1-3	Wetland							New	→
Punkah Island horseshoe	1-3	Wetland							New	→
Coombool Swamp	1-3	Wetland							New	→
Monomon depression	20 plants	Floodplain	✓	✓	✓		✓	✓		✓
Twin Creeks depression	20 plants	Floodplain	✓	✓	✓		✓	✓		✓

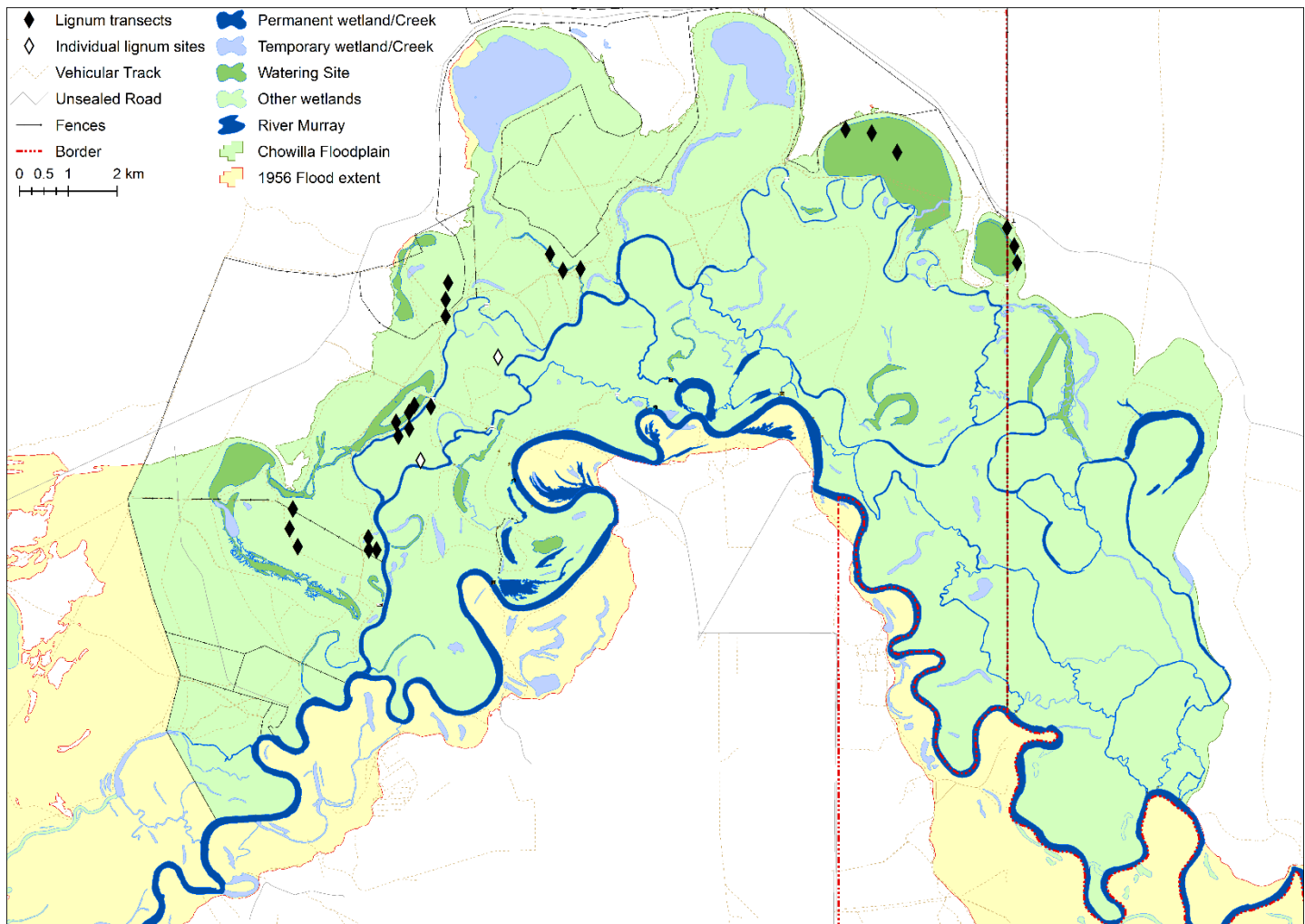


Figure 1: Map of the Chowilla Icon Site Floodplain showing the spatial distribution of the lignum monitoring sites. At each of the solid black diamonds there are three 5x100m transects, while the white diamonds are the locations where 20 individual (tagged) lignum plants are assessed.

1.3 Results

Lignum condition reported in Figure 2a is the pooled data from Coppermine Complex, Gum Flat, and Monomon Creek Depression. A slight increase in LCI across the Icon Site can be seen when the additional sites at Brandy Bottle, Lake Littra, and Werta Wert are included in the analysis (Figure 2b). The higher LCI at these sites can be attributed to the supply of environmental water (e-water) across the floodplain between 2013 and 2016. The three additional sites all received e-water, delivered through pumping in 2013. During the regulator testing event in October 2014, Werta Wert and a small section of Lake Littra received additional e-water. Brandy Bottle received e-water, delivered via pumping in November 2015, and a small top-up in late December 2015.

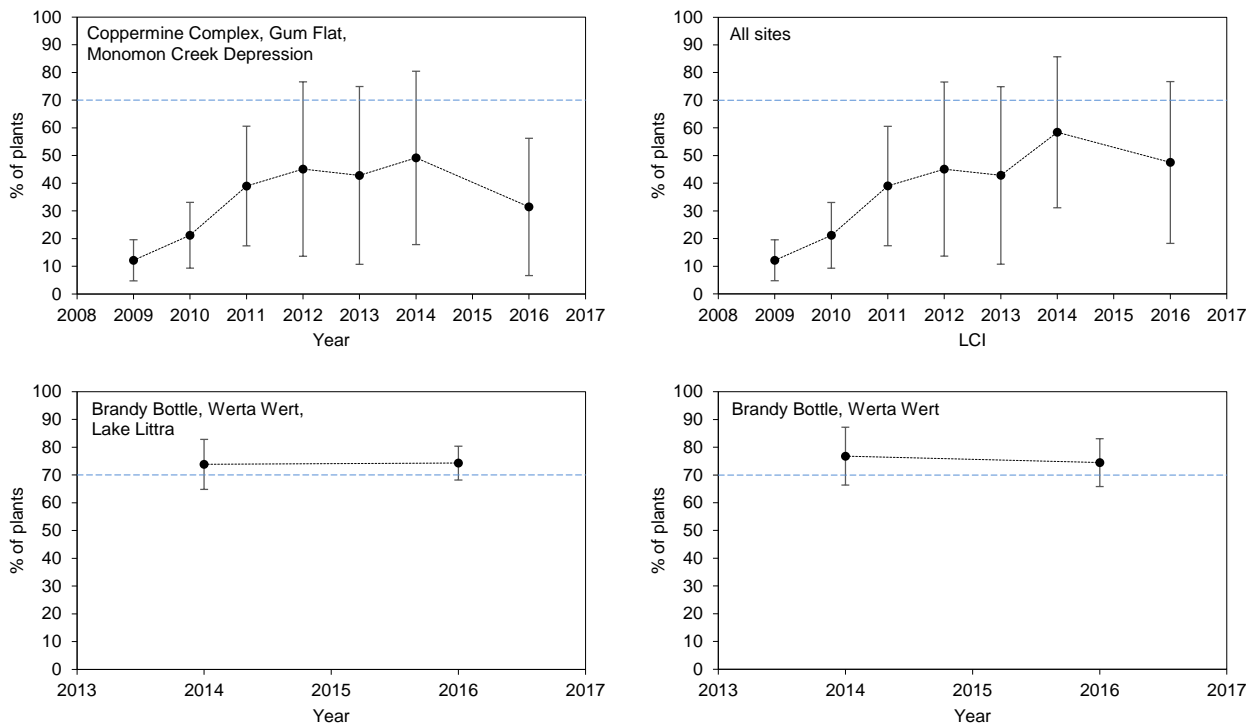


Figure 2: Percentage of lignum plants within standardised transects with LCI scores ≥ 6 . Horizontal reference line at 70% corresponds to the Ecological Target. Data points are the mean of results from transects listed in the top left of individual figures (a-d). Error bars are ± 1 standard deviation. Lines between data points are presented for visual clarity only and do not imply LCI scores between sampling times.

Mean LCI values were at the highest recorded in the surveys conducted in 2014. The Ecological Target for LCI across the floodplain has not been met. Where e-water has been delivered on a consistent basis (e.g. Brandy Bottle, Lake Littra, and Werta Wert) the ecological target of 70% of plants having a LCI ≥ 6 has been, or has been very close to being met. However, the threshold for management action has also been exceeded and there are $>10\%$ of plants having an LCI ≤ 2 (Figure 3). Data for individual transect sites is presented in Figures 3a-Figure 3h. The spatial coverage of standardised transects is currently being expanded to enable representative sampling at the Icon Site scale (See Table 3).

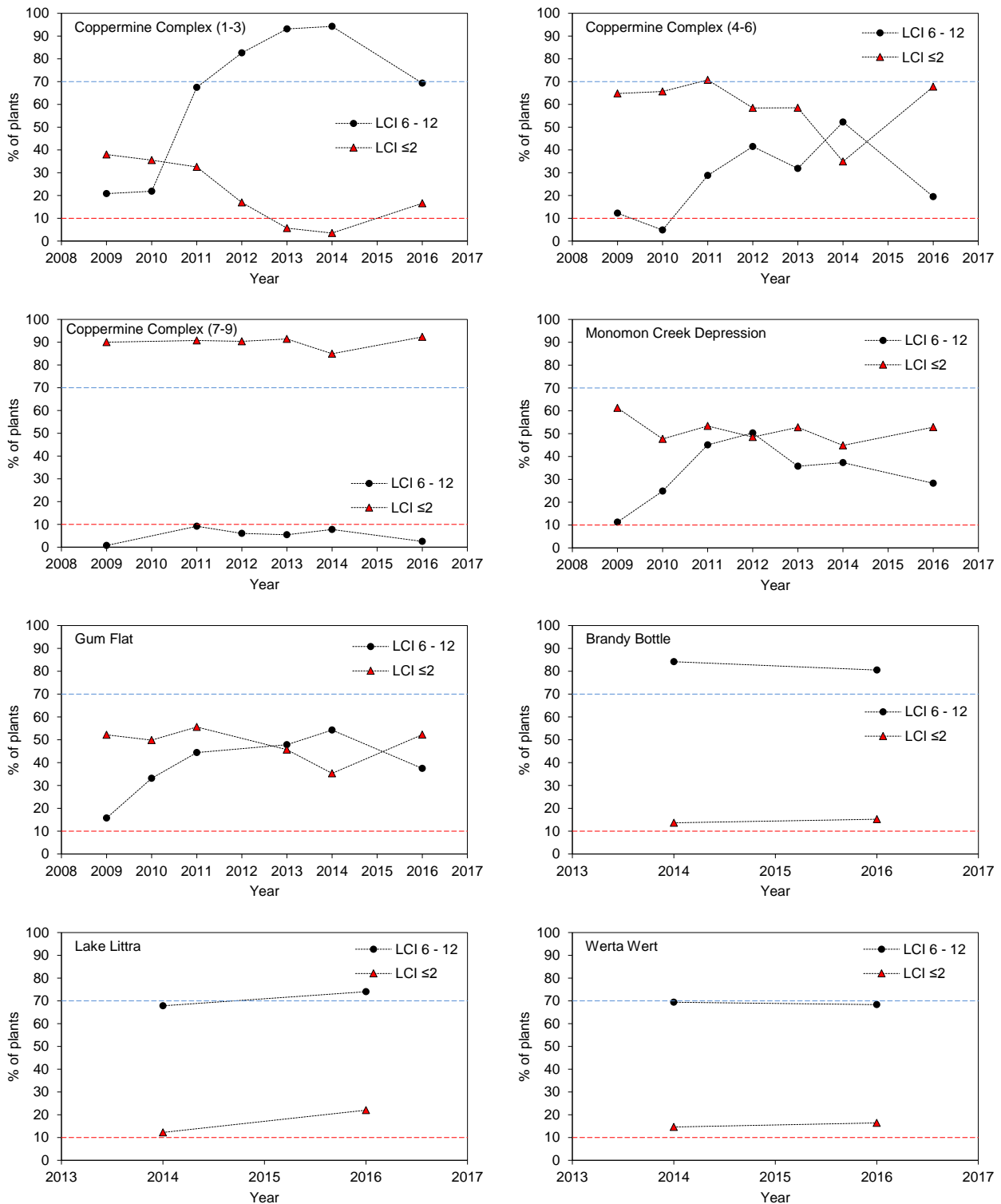


Figure 3: Percentage of lignum plants in good condition (LCI = 6-12), and very poor condition (LCI ≤2) at the lignum transects across the Chowilla Icon Site Floodplain. There are three transects at each site of 5 x 100m. The blue horizontal reference line at 70% corresponds to the Ecological Target (LCI ≥ 6). The red horizontal reference line at 10% corresponds to the management threshold "within the area that can be influenced by management action(s), more than 10% of established viable plants receive LCI scores ≤2". Lines between data points are presented for visual clarity only and do not imply LCI scores between sampling times.

Mean LCI values for the individual plant assessment transects were at the highest recorded in the surveys conducted in 2011 and 2014 for Monomon Depression and Twin Creeks Depression respectively. The Ecological Target for LCI at Monomon Depression has been met, although the % of plants with LCI ≥ 6 has been decreasing. There has been a substantial increase in the threshold for management action at the site at Twin Creeks Depression with nearly 30% of plants at the site having an LCI ≤ 2 during the 2016 monitoring (Figure 4b).

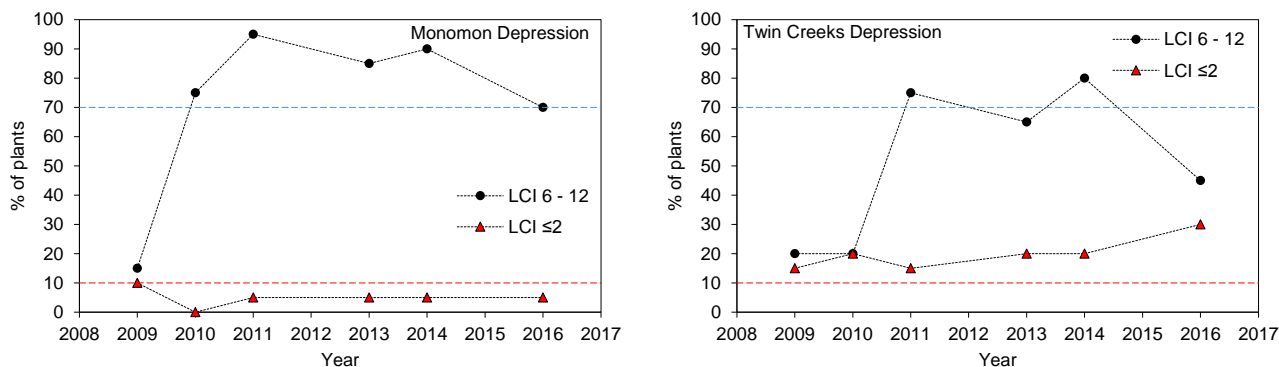


Figure 4: percentage of lignum plants in good condition (LCI = 6-12), and very poor condition (LCI ≤ 2) at Monomon Depression (20 plants) and Twin Creeks Depression (20 plants). The blue horizontal reference line at 70% corresponds to the ecological target (LCI ≥ 6). The red horizontal reference line at 10% corresponds to the management threshold "within the area that can be influenced by management action(s), more than 10% of established viable plants receive LCI scores ≤ 2 ". Lines between data points are presented for visual clarity only and do not imply LCI scores between sampling times.

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